WHAT IS CLAIMED IS:

1. A flowing junction reference electrode comprising:

a microfluidic liquid junction member situated between a pressurized reference electrolyte solution and a sample solution, the junction member comprising fewer than approximately 100,000 discrete nanochannels; and

a filter member, wherein the filter member is adapted to allow flow of the electrolyte solution through the filter member and into the junction member.

2. The electrode of Claim 1, wherein the junction member comprises greater than approximately 10 nanochannels.

3. The electrode of Claim 2, wherein the junction member comprises less than approximately 10,000 nanochannels.

4. The electrode of Claim 2, wherein the junction member comprises less than approximately 1,000 nanochannels.

5. The electrode of Claim 2, wherein the junction member comprises less than approximately 100 nanochannels.

6. The electrode of Claim 1, wherein the nanochannels are substantially straight and substantially parallel to one another.

7. The electrode of Claim 1, wherein the width of any one nanochannel is substantially equal to the width of any other nanochannel.

8. The electrode of Claim 1, wherein the nanochannels have widths of greater than approximately 1 nanometer and less than approximately 900 nanometers.

9. The electrode of Claim 1, wherein the nanochannels have widths of greater than approximately 100 nanometers and less than approximately 500 nanometers.

10. The electrode of Claim 1, wherein the filter member comprises a plurality of pores, and wherein the diameter of any one pore is greater than the diameter of any one nanochannel.

11. The electrode of Claim 1, wherein the filter member comprises a plurality of pores, and wherein the pores are substantially straight and substantially parallel to one another.

12. The electrode of Claim 1, wherein the filter member is configured to permit a volumetric flow of electrolyte solution through the filter member that is approximately equal to or greater than the volumetric flow capacity of the junction member.

13. The electrode of Claim 10, wherein the filter member comprises a plurality of nanochannels.

14. The electrode of Claim 1, wherein the nanochannels are coated.

15. The electrode of Claim 1, wherein the junction member comprises a polymer.

16. The electrode of Claim 15, wherein the polymer is selected from the group consisting of polycarbonate and polyimide.

17. The electrode of Claim 1, wherein the junction member comprises a material selected from the group consisting of silicon, glass, and ceramic.

18. The electrode of Claim 1, further comprising means for maintaining positive linear flow of the electrolyte solution through the nanochannels and into the sample solution.

19. The electrode of Claim 18, wherein the means for maintaining positive linear flow of the electrolyte solution through the nanochannels and into the sample solution is selected from the group consisting a pressurized collapsible bladder, an electro-osmotic pump, a mechanical pump, a piezo-electric pump, and a electro-hydrodynamic pump.

20. A combination electrode comprising:

a flowing liquid junction reference electrode comprising:

a junction member situated between a reference electrolyte solution and a sample solution, the junction member comprising fewer than approximately 100,000 discrete nanochannels; and

a filter member comprising an array of pores, wherein the filter member is configured such that the electrolyte solution flows through the filter member and into the junction member; and

a sensing electrode.

21. The combination electrode of Claim 20, wherein the sensing electrode is selected from the group consisting of pH electrodes, other ion-selective electrodes, and redox electrodes.

22. The electrode of Claim 20, wherein the junction member comprises less than approximately 10,000 nanochannels.

23. The electrode of Claim 20, wherein the junction member comprises less than approximately 1,000 nanochannels.

24. The electrode of Claim 20, wherein the junction member comprises less than approximately 100 nanochannels.

25. The electrode of Claim 20, further comprising means for maintaining positive linear flow of the reference electrolyte solution through the nanochannels and into the sample solution at a linear velocity greater than about 0.1 centimeter per second.

26. The electrode of Claim 20, wherein the means for maintaining positive linear flow of the electrolyte solution is selected from the group consisting of: a pressurized collapsible bladder, an electro-osmotic pump, a mechanical pump, a piezo-electric pump, and a electro-hydrodynamic pump.

27. The electrode of Claim 20, wherein the junction member comprises glass.

28. A microfluidic flowing junction reference electrode comprising:

a filter member having a plurality of pores;

a liquid junction member having a plurality of discrete nanochannels;

wherein the filter member and the junction member are configured to allow a pressurized electrolyte solution to flow through the pores and the nanochannels and into a sample solution;

wherein the junction member is positioned downstream from the filter member; and

wherein the electrolyte solution flows through the nanochannels at a linear velocity greater than about 0.1 centimeter per second.

29. The electrode of Claim 28, wherein the diameter of at least one pore is approximately equal to or smaller than the diameter of at least one nanochannel.

30. The electrode of Claim 28, wherein the number of pores is greater than the number of nanochannels.

31. A microfluidic flowing junction reference electrode comprising:

a first filter member having a first array of discrete nanochannels;

a microfluidic liquid junction member having a second array of discrete nanochannels;

wherein the first array and second array are configured to allow a pressurized electrolyte solution to flow through the first array and the second array and into a sample solution;

wherein the junction member is positioned downstream from the first filter member, and wherein the electrolyte solution flows through the second array at a linear velocity greater than about 0.1 centimeter per second;

wherein a typical diameter of the nanochannels of the first array is equal to or smaller than a typical diameter of the nanochannels of the second array; and

wherein the number of nanochannels of the first array is greater than the number of nanochannels of the second array.

32. The electrode of Claim 31, wherein a layer of the electrolyte solution separates the first filter member from the liquid junction member.

33. The electrode of Claim 31, further comprising at least one additional filter member positioned upstream of the first filter member, the at least one additional filter member having a second array of pores.

34. The electrode of Claim 31, further comprising at least one second filter member positioned upstream of the first filter member, the at least one second filter member having a third array of nanochannels.

35. The electrode of Claim 34, wherein a typical diameter of the nanochannels of the third array is equal to or greater than a typical diameter of the nanochannels of the first array.

36. The electrode of Claim 31, wherein the first filter is configured to exhibit a flux substantially greater than a flux associated with the liquid junction member.

37. The electrode of Claim 31, wherein the first filter is configured to exhibit a filtering capacity substantially greater than a filtering capacity associated with the liquid junction member.

38. The electrode of Claim 31, wherein the first array is configured to be capable of exhibiting a first volumetric flow rate that is greater than the volumetric flow rate exhibited by the second array.

39. The electrode of Claim 31, wherein the second array is configured to be volumetric flow rate determining for the electrode.

40. The electrode of Claim 31, wherein second array comprises less than approximately 100,000 and greater than approximately 10 nanochannels.

41. The electrode of Claim 31, wherein the second array comprises less than approximately 10,000 nanochannels.

42. The electrode of Claim 31, wherein the second array comprises less than approximately 1,000 nanochannels.

43. The electrode of Claim 31, wherein the second array comprises less than approximately 100 nanochannels.

44. A method for producing a sustained and prolonged flow of reference electrolyte solution through a liquid junction member of a flowing junction reference electrode, the method comprising:

providing a liquid junction member having a plurality of nanochannels;

providing a high flux and high capacity filter member to prevent clogging of the junction member with particulate matter present in a reference electrolyte solution that flows through the filter member and into the junction member.

45. The method of Claim 44, wherein the junction member comprises less than 100,000 nanochannels.

46. The method of Claim 45, wherein the filter member comprises nanochannels that have diameters that are approximately equal or smaller than the diameters of the nanochannels of the junction member.

47. The method of Claim 46, wherein the filter member comprises nanochannels that have diameters of approximately less than 300 nanometers and wherein the diameters of the nanochannels of the junction member are approximately greater than about 300 nanometers and smaller than about 900 nanometers.

48. The method of Claim 44, wherein the filter member exhibits a relatively high flux such that the linear velocity of electrolyte solution flowing through the nanochannels is substantially unchanged.

49. The method of Claim 48, wherein the filter member is configured such that even after a substantial percentage of the pores of the filter member have clogged with particulate material, the filter member allows passage of a sufficient amount of electrolyte solution to the junction member such that the linear velocity of the electrolyte solution through the nanochannels is sufficient to substantially prevent back diffusion of a sample solution into the nanochannels.

50. A method of manufacturing a junction reference electrode, the method comprising:

providing a pressurized electrolyte solution;

providing a filter member having a first plurality of nanochannels;

providing a flowing liquid junction member having a second plurality of nanochannels;

wherein the electrolyte solution flows through the filter member and into the junction member; and

wherein the filter member is configured to allow a flux of the electrolyte solution through the filter member that is much greater than a flux of the electrolyte solution through the junction member.

51. The method of Claim 50, the filter member is positioned adjacent to the junction member such that the electrolyte solution flows through the filter member into a discrete layer of electrolyte solution and then through the junction member.

52. The method of Claim 50, wherein the filter member and the junction member are configured such that the electrolyte solution flows through the filter member and feeds all the nanochannels of the junction member in sufficient volume such that the electrolyte solution flows through anyone of the nanochannels of the junction member with substantially the same flux and linear velocity as the electrolyte solution flows through any other nanochannel of the junction member.

53. A flowing junction reference electrode comprising:

a microfluidic liquid junction member situated between a pressurized reference electrolyte solution and a sample solution, the junction member having an array of fewer than approximately 100,000 discrete nanochannels, and the junction member having a coating comprising a growth inhibitor.

54. The electrode of Claim 53, wherein the number of nanochannels is less than approximately 1,000.

55. The electrode of Claim 53, wherein the number of nanochannels is less than approximately 10,000.

56. The electrode of Claim 53, wherein the nanochannels have widths of greater than approximately 1 nanometer and less than approximately 900 nanometers.

57. The electrode of Claim 53, wherein the nanochannels have widths of greater than approximately 100 nanometers and less than approximately 500 nanometers.

58. The electrode of Claim 53 wherein the nanochannels are coated with the growth inhibitor.

59. The electrode of Claim 53, wherein a surface of the junction member exposed to a sample solution is coated with the growth inhibitor.

60. The electrode according to any one of Claims 53, 58, or 59, wherein the growth inhibitor is a biocide.

61. The electrode according to any one of Claims 53, 58, or 59, wherein the growth inhibitor is butyl paraben.

62. The electrode according to any one of Claims 53, 58, or 59, wherein the growth inhibitor is a metal.

63. The electrode according to any one of Claims 53, 58, or 59, wherein the growth inhibitor is copper.

64. The electrode of Claim 53, wherein the electrolyte solution comprises a growth inhibitor.

65. The electrode of Claim 64, wherein the growth inhibitor of the electrolyte comprises a biocide.